

STEREO MOC Status Report
Time Period: 2015:089 - 2015:095

STEREO Ahead (STA) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- On day 089, during the DSS-14 support, with the observatory rotating at 5 degrees per minute on the +Z LGA, telemetry lock was never received due to the low signal strength as the LGA is on the edge of the hemispherical pattern. Carrier lock was intermittent with the carrier power between -168 and -174 dBm. Carrier lock was lost at 1700z for 6 minutes due to the first hard command loss timer (HCLT) initiated system reset. At 1704z, telemetry lock was received from the HGA second side lobe. Telemetry lock was lost at 1747z for 15 minutes and again at 1859z for 7 minutes. Post reset, 419 telemetry frames or 67% of the expected frames were received on the HGA second side lobe.
- On day 090, during the DSS-14 support, with the observatory rotating at 5 degrees per minute on the -Z LGA, telemetry lock was never received due to the low signal strength as the LGA is on the edge of the hemispherical pattern. Carrier lock was intermittent with the carrier power between -169 and -175 dBm.
- On day 091, during the DSS-63 support, with the observatory rotating at 5 degrees per minute on the -Z LGA, telemetry lock was never received due to the low signal strength as the LGA is on the edge of the hemispherical pattern. Carrier lock was intermittent with the carrier power between -169 and -174 dBm.
- On day 092, during the DSS-14 support, after the 3rd HCLT initiated system reset with the observatory rotating at 5 degrees per minute on the second HGA side lobe, telemetry was received intermittently except for an 8 to 10 minute gap during each 72 minute rotation. 378 good telemetry frames or 59% of the expected frames were received.
- On day 093, during the DSS-63 support, with the observatory rotating at 5 degrees per minute on the second HGA side lobe, carrier lock and telemetry were received

intermittently during each 72 minute rotation. 378 good telemetry frames or 28% of the expected frames were received.

- On day 094, during the DSS-43 support, with the observatory rotating at 5 degrees per minute on the +Z LGA, telemetry lock was never received due to the low signal strength as the LGA is on the edge of the hemispherical pattern. Carrier lock was intermittent with the carrier power between -168 and -178 dBm.
- On day 095, during the DSS-43 support, after the 4th HCLT initiated system reset with the observatory rotating at 5 degrees per minute on the second HGA side lobe, telemetry was received intermittently except for a 15 to 23 minute gap during each 72 minute rotation. 395 good telemetry frames or 52% of the expected frames were received. Note that this was the last DSN support until the Ahead observatory exits superior solar conjunction on June 29th.

2. The following spacecraft/instrument events occurred during this week. Note that the Ahead observatory is operating on the second side lobe of the HGA to prevent overheating of the HGA feed assembly which is currently at 113 degrees C with the HGA angle at 8.1 degrees, with respect to the spacecraft-Sun line.

- On day 089 at 1640z, the Ahead observatory initiated the 2nd planned HCLT system reset during solar conjunction. The DSN received a strong downlink signal at 1703z and telemetry was received at 1704z. The star tracker was again "lazy" in re-acquiring a solution causing IMU2 to power on for two hours. The SWAVES instrument remains on as planned. The IMPACT and PLASTIC space weather SSR partitions remain at 53 and 51 percent full respectively, and SWAVES, which is continuing to record at one packet per minute, is at 34.4 percent full. The HGA feed temperature was at 113 degrees C.
- On day 092 at 1700z, the Ahead observatory initiated the 3rd planned HCLT system reset during solar conjunction. The daily DSN support occurred 5 hours after the reset and IMU2 was off. The star tracker was again "lazy" in re-acquiring a solution causing IMU2 to power on for two hours. The SWAVES instrument remains on as planned. The IMPACT and PLASTIC space weather SSR partitions remain at 53 and 51 percent full respectively, and SWAVES, which is continuing

to record at one packet per minute, is at 35.5 percent full. The HGA feed temperature was at 113 degrees C.

- On day 095 at 1720z, the Ahead observatory initiated the 4th planned HCLT system reset during solar conjunction. The star tracker was again "lazy" in re-acquiring a solution causing IMU2 to power on for two hours. The daily DSN support occurred 4 hours after the reset and IMU2 was off. The SWAVES instrument remains on as planned. The IMPACT and PLASTIC space weather SSR partitions remain at 53 and 51 percent full respectively, and SWAVES, which is continuing to record at one packet per minute, is at 36.0 percent full. The HGA feed temperature was at 113 degrees C.

STEREO Behind (STB) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- None.

2. Detailed status of the activities that occurred on the Behind loss of communication anomaly, which occurred on day 2014-274, are listed below.

- The Behind observatory entered superior solar conjunction at the two degree SPE angle on day 022. Recovery efforts will resume post solar conjunction on day 124, May 4th; with implementing the Failure Review Board recommendations and increasing the ground transmit power through arraying uplink stations.

Significant findings to date:

1. Analysis of the three DSN extracted telemetry frames from the carrier signal just before the planned observatory reset/anomaly occurred on day 2014-274, October 1st, showed nominal performance of the spacecraft, i.e., no anomalies, IMU off, and the star tracker providing an attitude solution.
2. Post reset, from the very limited telemetry, three packets, extracted from the carrier signal by the DSN, the X-axis gyro on IMU-A had failed. Unfortunately, this telemetry contained only G&C anomaly data and no spacecraft summary

data, i.e., the state of the RF, G&C, fault protection and other subsystems is not known at the time of the anomaly. With a failed IMU and the star tracker being off-line for an undetermined duration, the sun sensors will keep the observatory pointed at the Sun, though the G&C will not have any roll knowledge, and cannot roll the observatory as part of the safing configuration to re-establish communications on the LGAs. From analysis of this telemetry and initial G&C simulations, it is highly suspected that the observatory is rotating about the principal axis of inertia due to an autonomous momentum dump initiated by biased gyro data flagged good by the IMU, but this has not yet been confirmed.

3. At least two anomalies occurred post reset, the star tracker not promoting to AAD mode and the X-axis gyro failure. Unfortunately, due to the number of possible combinations, the STEREO fault protection system is not designed for simultaneous failures.

The cause and effect analysis of the loss of communications from the LGAs is continuing. G&C simulations using the biased gyro data flagged good by the IMU are continuing to better understand the potential impact to the observatory state. Recovery from a negative power state is also being investigated. While the recovery and analysis efforts continue on Behind, as the Ahead observatory will enter superior solar conjunction in March, the primary focus of the engineering team is on developing operational configuration changes to add robustness to the G&C rate sensor usage to ensure the Ahead observatory's continued safety.

Once communications are restored and the anomaly resolved, the Behind observatory will be returned to nominal science data collection as soon as it is safely possible.